Hence the area of the required triangle is

$$\frac{\triangle abc[l(m'n''-m''n')+m(n'l''-l'n'')+n(l'm''-l''m')]^2}{ABC}.$$

Also solved by the Proposer.

**315. Proposed by ROBERT E. MORITZ, Ph. D., University of Washington.**

Given the area of the segment of a circle of given radius to find the length of the chord.

**Solution by G. B. M., ZERR, A. M., Ph. D., 4243 Girard Avenue, Philadelphia, Pa.**

I. Let $r$=radius and $2x$=the length of the chord. Also let $A$=arc of segment. Then

$$\tfrac{4}{3}x[r-\sqrt{(r^2-x^2)}\,[+\frac{[r-\sqrt{(r^2-x^2)}]^3}{4x}=A.$$

$$\therefore 169x^5+192r^2x^3-168Arx^2+144(A^2-r^4)x-288Ar^3=0.$$

If $A$ and $r$ are known, $x$ can be found.

II. Let $\theta$=angle of segment at center of circle. Then

$$\tfrac{1}{2}r^2(\theta-\sin\theta)=A,\ \ x=r\sin\tfrac{1}{2}\theta.$$

By double position $\theta$ is found.

III. $r^2[\sin^{-1}\dfrac{x}{r}-\dfrac{x}{r^2}\sqrt{(r^2-x^2)}]=A$. Let $\dfrac{x}{r}=z$.

$\therefore r^2[\sin^{-1}z-z\sqrt{(1-z^2)}]=A.$

$\therefore \tfrac{2}{3}z^3+\tfrac{1}{5}z^5+\tfrac{3}{28}z^7+\tfrac{5}{72}z^9+\ldots=A/r^2.$

By reversion of series $z$ is found, then $x=rz$.

**316. Proposed by J. STEWART GIBSON, Department of Physics, Wadleigh High School, New York City.**

Determine the locus of the vertices of parabolas described by particles thrown off from the circumference of a uniformly revolving wheel.

**I. Solution by the PROPOSER.**

Let $r$=radius of circle, $a$=velocity of its periphery, $\phi$=angular position of particle $b$ at moment of projection, $a_v$=vertical component of initial velocity, and $a_h$=horizontal component of initial velocity. Then $a_v=a\cos\phi$. The height, $y_1$, to which the particle will rise is (since $h=v^2/2g$),

$$y_1=r\sin\phi+\frac{a^2\cos^2\phi}{2g}. \tag{1}$$